The Journal of ELECTRICITY POWER and GAS

DEVOTED TO THE CONVERSION, TRANSMISSION and DISTRIBUTION OF ENERGY.

VOL. XIV.—No. 3 SAN FRANCISCO, CAL., MARCH, 1904. YEARLY SUBSCRIPTION - $2.00 SINGLE COPIES - 25 CENTS

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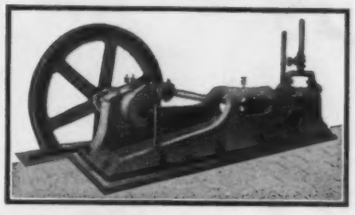

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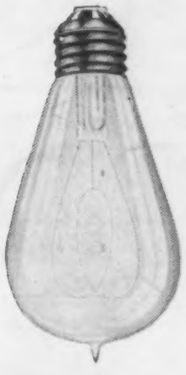

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SOME EXAMPLES OF NORTHERN MOTOR APPLICATIONS 143

SELECTED at random from our store of illustrations of equipments of machine and machine tools embodying Northern Apparatus. The types of machine are known to all; the motor-driven types are destined to become favorably known to all because they are living daily proofs of the economy of motor drive with Northern Motors, and are doing important faithful missionary work for the new creed.

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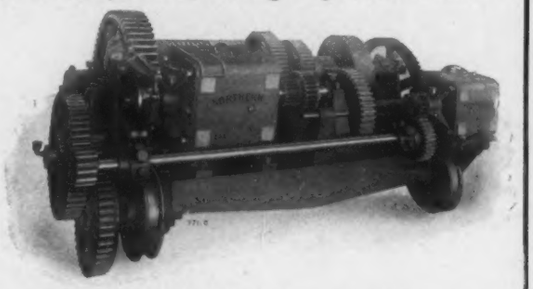
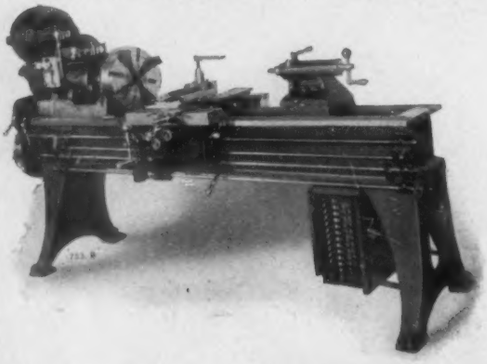
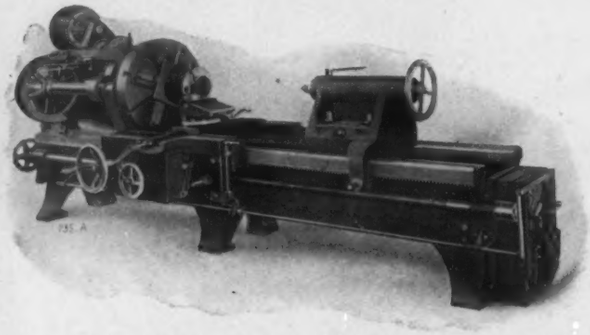


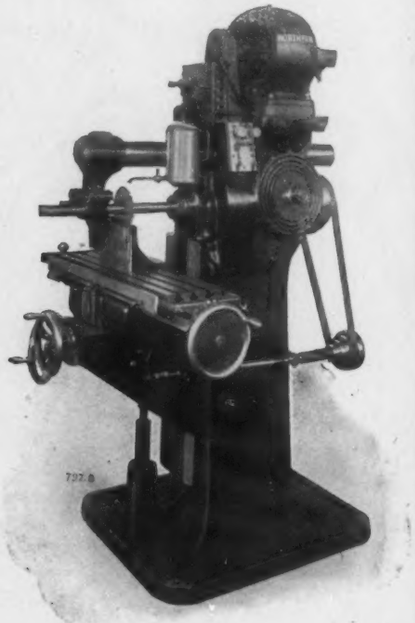
Crane Trolley Equipped With Northern Steel Crane Motors



Sixteen Inch Ideal Lathe—Northern Spherical Motor
Variable Speed Control From Carriage



Twenty-eight Inch Pond Lathe—Northern Spherical Motor
Variable Speed Control From Carriage



Brown & Sharp Horizontal Milling Machine
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The Journal of Electricity, Power and Gas.

Devoted to the Conversion, Transmission and Distribution of Energy.

VOLUME XIV. SAN FRANCISCO, CAL., MARCH, 1904. NUMBER 3

The Yreka Light and Power Transmission.

BY LEON M. HALL.

THE development of the streams of extreme northern California for power and lighting purposes has practically just begun, and among the pioneers along this line may be mentioned the new installation of the Yreka Electric Light and Power Company, situated on the Shasta River, in Siskiyou County,

STREET IN YREKA SHOWING POLES AND TRANSFORMERS

about five miles northerly from Yreka city. This plant is the property of E. T. Osborn, of San Francisco, and was constructed in place of the old "Quinne Plant" to furnish light and power to the district in the vicinity of Yreka. The field is limited to the city lighting and to the power necessary for dredging and mining purposes. There are several good mines in this immediate vicinity, and the old river beds carry gold bearing gravel in large quantities.

Up to the present writing the great drawback to the development and operation of these various properties lay in the lack of power, the scarcity of fuel and consequent high cost of producing such power. The completion of this plant, therefore, opens up a new avenue, and it is confidently expected that the near future will see several new enterprises under way, each having the Yreka plant as the source of power.

The lighting load of the plant will be confined almost entirely to Yreka and Montague, these two localities being already wired for between 2500 and 3000 lights. The circuit has not as yet been extended to Montague, but will be as soon as the spring opens.

Power in this market retails at about $5.00 per horsepower-month, and from present indications it will not be a great while before the plant is operating night and day at its full capacity.

As already stated, the generating station is situated on the eastern bank of the Shasta River at a point about five miles northerly from Yreka city, near the site of the old "Quinne Plant." The latter plant was constructed some years ago for the purpose of lighting Yreka, and consisted of a 150-kilowatt, two-phase, 133-cycle, Stanley generator, which was driven by a Knight wheel under a head of twenty-four feet and a Leffel turbine under thirty-six feet. In order to modernize the plant it was decided to rebuild and replace wheels, generator, line and transformers with material best suited to the conditions. The dam and ditch were repaired and left practically as they originally existed; all else, including city distribution, being entirely reconstructed.

DAM—The dam consists of a rock filled crib structure about 150 feet in length and four feet high, and was constructed across the Shasta River at a point about one-half a mile northeasterly from the power house. The dam is designed for diversion only, and turns the stream through a substantially constructed intake on the eastern bank of the stream. This intake is equipped with wooden head gates and hoisting mechanism, and a substantial

TRANSPORTING WHEELS TO POWER SITE

waste way adjoins it on the west, this waste way being also equipped with lifting gates and a fish ladder.

DITCH—The ditch has an average cross-section of about seventy square feet, is about fourteen feet wide, five feet in depth and about 2000 feet in length. Under ordinary conditions it carries about four and one-half feet of water,

L. of C.

POWER HOUSE ON SHASTA RIVER

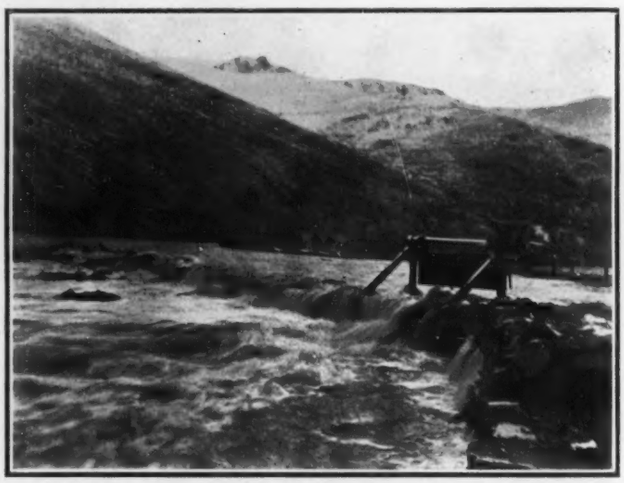
which is sufficient to operate the plant at its full load capacity. The ditch was constructed along the eastern bank of the river, the outer or river side of the same consisting of a rock wall laid up in sand.

Taken as a whole, the ditch is a good one and carries the required volume of water safely and readily. The head works above the power house were constructed by enlarging and deepening the lower end of the ditch and inserting the pressure pipes through a concrete wall on the river side of the same. A timber frame work was placed about the upper end of the pressure pipes, and to this was bolted the guides for the wooden head gates. A wooden rack was placed ahead of the gates so that all trash is prevented from entering the wheels. The waste way is at the extreme lower end of the ditch, the water flowing over a wooden gate when it has reached a level three feet above the intake.

POWER HOUSE—The power house is a substantial corrugated iron structure, with a wooden frame work, thirty-three feet six inches wide and forty-eight feet long, situated upon the eastern bank of the Shasta River. The lower floor of the station is about two feet above high water, and the spillways are cut to a depth of about four feet below low water. To avoid excessive grading in extremely hard rock the generators and exciters are placed twenty feet to the east of the wheel centers and seven feet above the wheel foundations. This arrangement gives an unobstructed floor on a level above the top of the pressure pipes, from which ample stairways lead down to the flooring about the wheels. The wheels are operated and regulated from an enclosure just over the wheel casings and adjacent to the river side of the power house. This enclosure is constructed of tongued and grooved planking, and has a glass front on the side facing the switchboard.

REBUILDING WASTE WAY

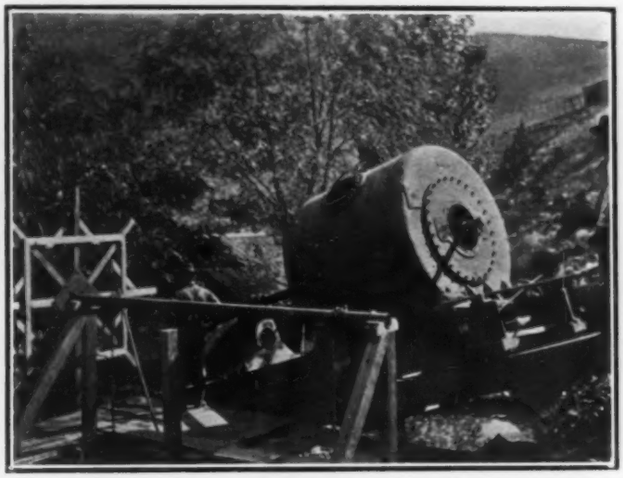
WHEELS—The wheels consist of two twenty-four-inch cylinder gate turbine water wheels, which are designed to deliver 250 horsepower at 430 revolutions per minute. These wheels were manufactured by the Stillwell-Bierce & Smith-Vaile Co., of Dayton, Ohio, and are certainly models of their type. They are placed upon concrete foundations ten feet above low water, a draft tube twelve feet in length extends downward from each unit, and it is submerged to a depth of two feet at the extreme low stage of the river. The wheel casing and two generator type self-oiling bearings are secured to a pair of fifteen-inch steel I-beams, the latter being securely bolted to the aforesaid concrete foundations. Each wheel is fitted with a steel shaft five and one-half inches in diameter, and upon this shaft is mounted a fifty-six-inch pulley having a twenty-five-inch face. Each wheel casing is connected with the penstock by means of a forty-eight-inch riveted steel pipe five-sixteenths of an inch in thickness, said pipes having a funnel shaped opening where they enter the penstock.



SCENE AT THE DAM

The wheels are fitted with cylinder gates, the mechanism of which is operated by hand or a Woodward governor, as the occasion demands. The regulation obtained is all that could be desired, and the voltage remarkably steady for a plant of this character. These wheels are designed to show a maximum efficiency at 430 revolutions per minute under an effective head of thirty-six feet.

WHEELS AND GENERATORS IN PLACE

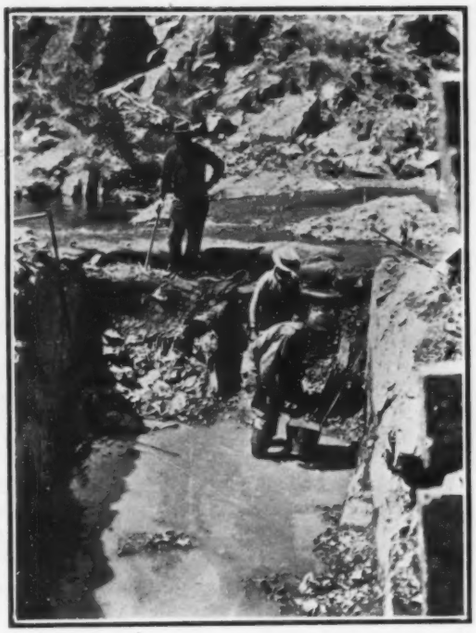


STARTING WHEEL DOWN THE HILL

They are belted to the generators by means of twenty-four-inch double leather belts, and are perfect in their operation.

The exciter wheel is a standard twelve-inch bronze register gate Victor turbine, and it is connected to both pressure pipes, the valves being so placed that water can be taken from either side. The direct current exciter unit, located on the floor above, is belted to this wheel, which is fitted with a draft tube, the regulating device being directly in front of the switchboard.

ELECTRICAL EQUIPMENT — The electrical equipment consists of two 180-kilowatt, three-phase, sixty-cycle, Westinghouse, revolving field generators, one eleven and one-quarter-kilowatt, multipolar, compound wound, Westinghouse, direct current exciter unit and two three-phase generator switchboard panels. The generators are the latest type of revolving field machines which at 514 revolutions per minute generate at a potential of 6600 volts. The exciter unit has capacity sufficient to magnetize the field of both generators, and at a speed of 1200 revolutions per minute produces direct current at a potential of 125 volts.

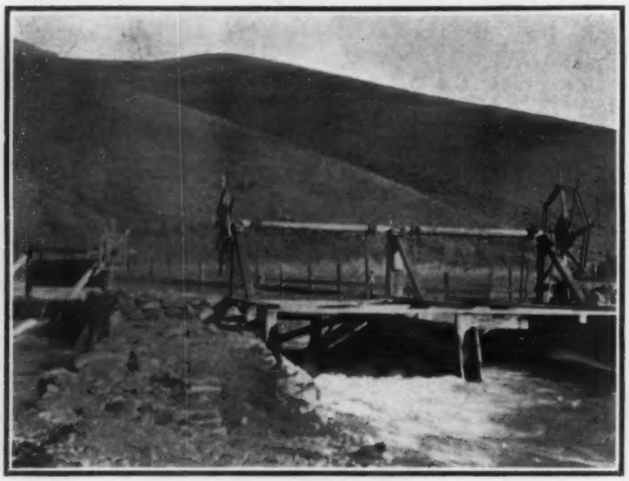


EXCAVATING TAILRACE

The generators are erected upon substantial concrete foundations and are belted directly onto the wheel shaft. The exciter is located conveniently in front of the switchboards, and is belted to the twelve-inch exciter wheel. The 6600-volt primary leads from the generators are connected with Westinghouse triple-pole oil-break switches placed near the bottom of the switchboard panels; from thence the current is

WASTE WAY, EAST END OF DAM

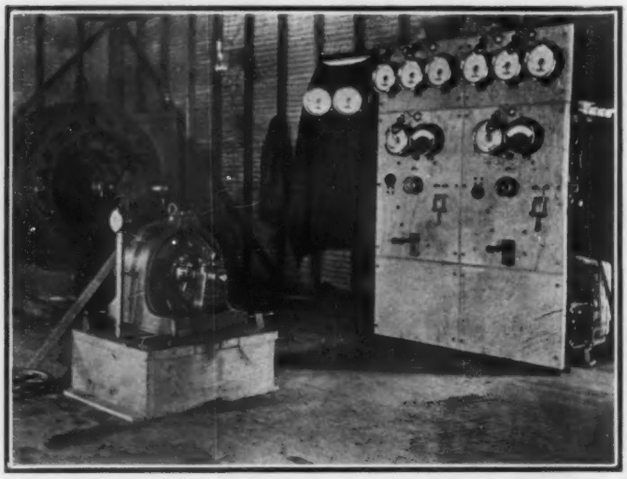
FLOATING SAND DOWN THE DITCH



GATE AT HEAD OF DITCH

delivered directly to the line wires. Provision has been made for operating either generator upon either circuit, and herein lies one of the features of the plant. It is obvious that machines of this size cannot be operated successfully upon a combined power and lighting circuit, so that provision has been made to prevent the excessive fluctuation in voltage, so common in small installations, by separating the power and lighting circuits and operating them upon separate machines. The result is the best that could be expected, and with the Woodward governors in commission there is scarcely any variation in the line voltage. The switchboards are of blue Vermont marble, upon which are mounted the necessary ammeters, voltmeters and indicating wattmeters. The instruments are of the long scale steam gauge type, and present a very handsome appearance. A set of 7500-volt lightning arresters protect each circuit at the entrance to the building. The transformers are all Westinghouse oil transformers, varying in size from two kilowatts to fifteen kilowatts, and transform from a potential of 6600 volts to 220–110 volts.

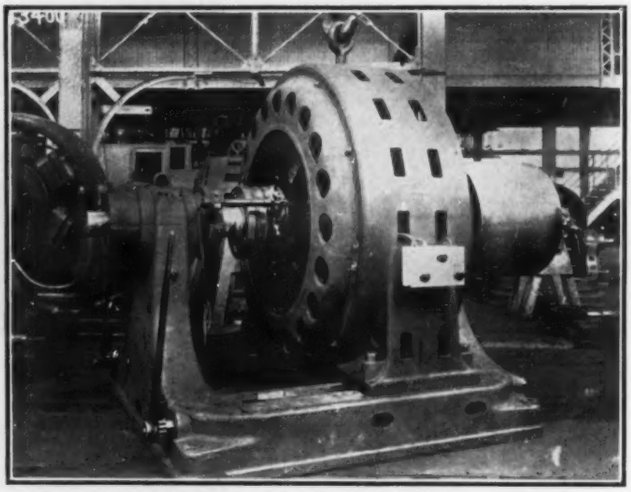
It was ascertained soon after beginning operations that the plant required very little attention, inasmuch as the



SWITCHBOARD

entire machinery is in perfect alignment, and the automatic regulation all that could possibly be desired.

LINES—A double three-phase circuit of No. 4 medium hard drawn copper wire extends from the power station to Yreka city, a distance of about five miles. One circuit is used for lighting purposes exclusively and the other for power. The lines are erected upon white Idaho cedar poles thirty feet in length and spaced 133 feet apart. Deep grooved insulators are placed upon four-inch by five-inch pine cross-arms, and the lines are securely fastened with a double cinch tie. The two circuits are upon opposite sides of the poles in equilateral triangles measuring two feet on a side. The poles are set four and one-half feet into the ground, and each corner is securely guyed with five-sixteenth-inch wire rope. The generating potential of 6600 volts is taken direct to the transformers placed upon the poles at convenient intervals about the city. In locating the transformers, great care was exercised to balance the phases so that no trouble has been experienced from this source.



THE WESTINGHOUSE GENERATOR

DISTRIBUTION CIRCUITS—The same general plan was followed out in the distribution circuits, excepting that weather-proof copper was used instead of the bare wire. The entire city has been re-wired and is now in first-class condition. All of the buildings were gone over carefully and all interior wiring done with 600-volt rubber covered wire in accordance with the Underwriters' regulations. Each circuit is amply fused before it enters the building, and each branch circuit and lamp are also equipped in a similar manner. The secondary circuits are either 110 volts or 220 volts with a neutral wire, and these are so calculated that absolute uniformity exists in the lamp voltage.

CITY LIGHTING—At the present time the streets are illuminated by means of twelve General Electric constant potential arc lamps and thirty-six thirty-two candlepower incandescents. These are suspended across the streets by means of a cord and pulley, and are each equipped with a porcelain lined shade. The necessary switches

are provided so that the lights are extinguished during the day time. A telephone circuit of No. 12 galvanized iron wire on pony insulators extends from the power house to the company's office in Yreka. This circuit is carried on thirty-inch pine cross-arms and pony insulators four feet below the main line wires.

All things taken into consideration, it may be safely stated that the plant of the Yreka Electric Light and Power Company is one of the best and most complete installations of its kind on the coast, and its projectors and patrons have every reason to expect only the very best results therefrom.

TECHNICAL AND ENGINEERING DATA

Dam—

The dam is a rock filled wooden crib structure about 150 feet in length and 4 feet high. A wooden gate, spillway and fish ladder are located near the eastern end of the dam. Wooden head gates are located at the extreme eastern end of the dam.

Ditch—

The ditch is cut into the sloping hillside, has an average width of 14 feet, a depth of 5 feet and a maximum capacity of about 200 cubic feet per second.

Penstock and Pipe Lines—

The penstock consists of a depression at the lower end of the ditch, the outer side of which is of concrete, and the pressure pipes pass directly through the same. Two wooden gates 5 inches by 5 inches by 4 feet are operated by means of a ratchet and rack and pinion in wooden guides. The frame work for these gates is built into the concrete wall. The overflow is at the extreme end of the ditch beyond the gates. The screen consists of a wooden rack set at an angle of about 45 degrees. The pressure pipe consists of two lines of 48-inch riveted steel pipe 3-16-inch in thickness and extends from the penstock to the wheel casings. Each pipe is fitted with an air vent at its highest point, and water covers the funnel shaped intake to a depth of 3 feet.

Wheels—

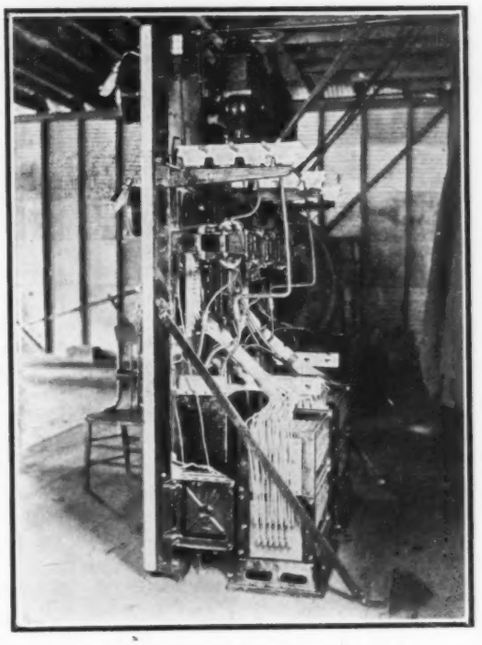
The wheels consist of two 24-inch single cylinder gate turbine water wheels, capacity 250 horsepower at 430 revolutions per minute, each equipped with a Woodward governor. The exciter wheel is a 12-inch bronze register gate Victor turbine. Wheels belted to generators.

Electrical Equipment—

The electrical equipment consists of two 180-kilowatt, 3-phase, 6600-volt, 60-cycle, Westinghouse revolving field generators, one 11¼-kilowatt, compound wound, multipolar, direct current exciter unit and two generator switchboard panels, with the necessary ammeters, voltmeters and indicating wattmeters; also two sets of 7500-volt lightning arresters. Transformers consist of three 15-kilowatt, three 10-kilowatt, nine 5-kilowatt and six 2-kilowatt Westinghouse oil transformers from 6600 to 220–110 volts.

Power House—

The power house is a corrugated iron structure 33 feet 6 inches wide and 48 feet long. The frame work is of pine timber and the covering No. 26 corrugated galvanized iron.



BACK OF SWITCHBOARD, SHOWING WIRING DETAIL

Transmission Line—

Length of the transmission line is about five miles and consists of two 6600-volt, 3-phase circuits of No. 4 medium hard drawn bare copper wire.

Poles, 30-foot white Idaho cedar, 133 feet apart and set 4½ feet into the ground.

Pine cross-arms, two-pin arms 4 inches by 5 inches by 60 inches, and four-pin arms 4 inches by 5 inches by 84 inches.

Deep grooved, double-petticoated glass insulators are mounted upon oak pins.

Guy wire 5-16-inch galvanized wire rope.

Telephone Circuit—

About ten miles of No. 12 (Stubbs) galvanized iron wire 3¼-inch by 4¼-inch by 30-inch cross-arms on pony insulators and oak pins.

Distribution Circuits—

Distribution circuits are laid out for about 3000 incandescent lamps and 12 General Electric multiple arc lamps.

Construction similar to transmission line except that weatherproof copper wire is used.

Secondary voltage 110 and 220.

Inside wiring all done with 600-volt rubber covered wire on porcelain knobs and cleats.

City Lighting—

Ten General Electric enclosed multiple arc lamps.

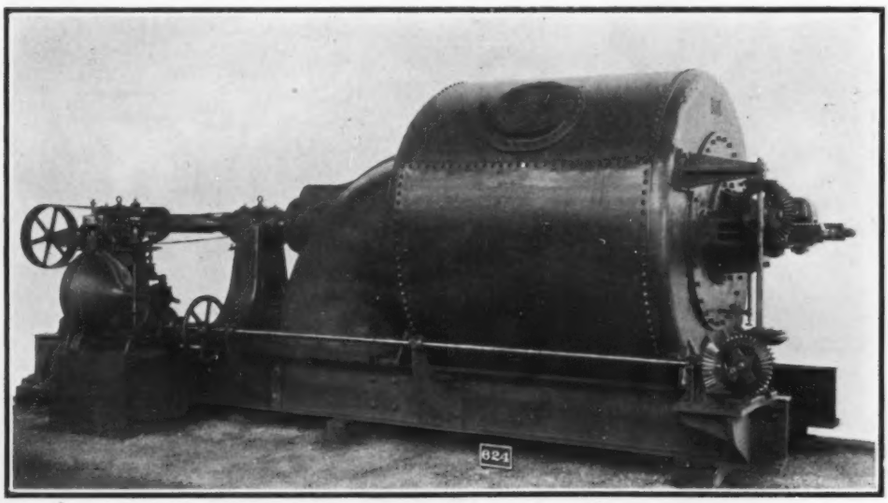
Thirty-six 32 candlepower incandescent lamps.

Power Circuit—

This consists of one of the two transmission circuits, and the transformation is arranged to suit the motor conditions.

Personnel—

E. T. Osborn of 510 Montgomery Street, San Francisco, is managing owner of the plant and Leon M. Hall, 814 Hayward Building,



VICTOR TURBINE AND WOODWARD GOVERNOR

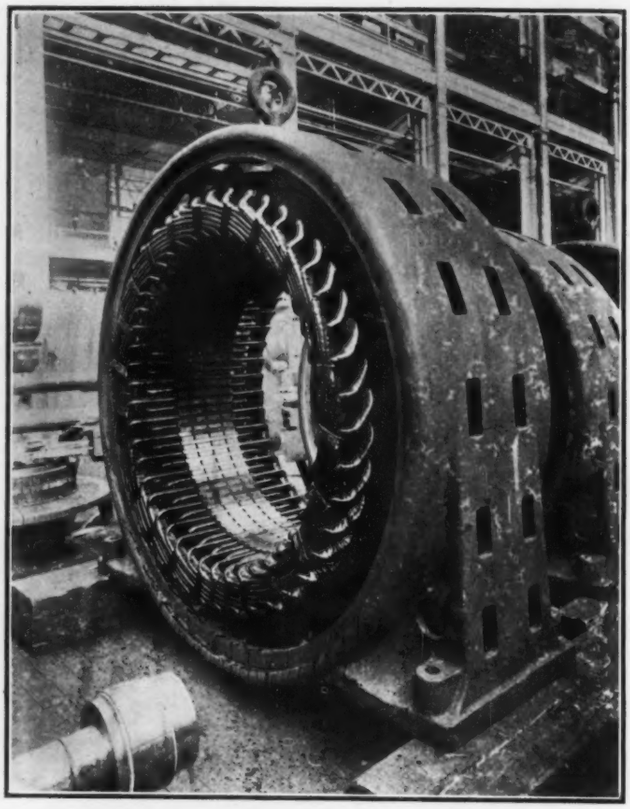
consulting engineer. The construction was under the direction of A. C. Sprout, of San Francisco, and Matt McGuirk is the present superintendent.

A NEW PUBLICATION.

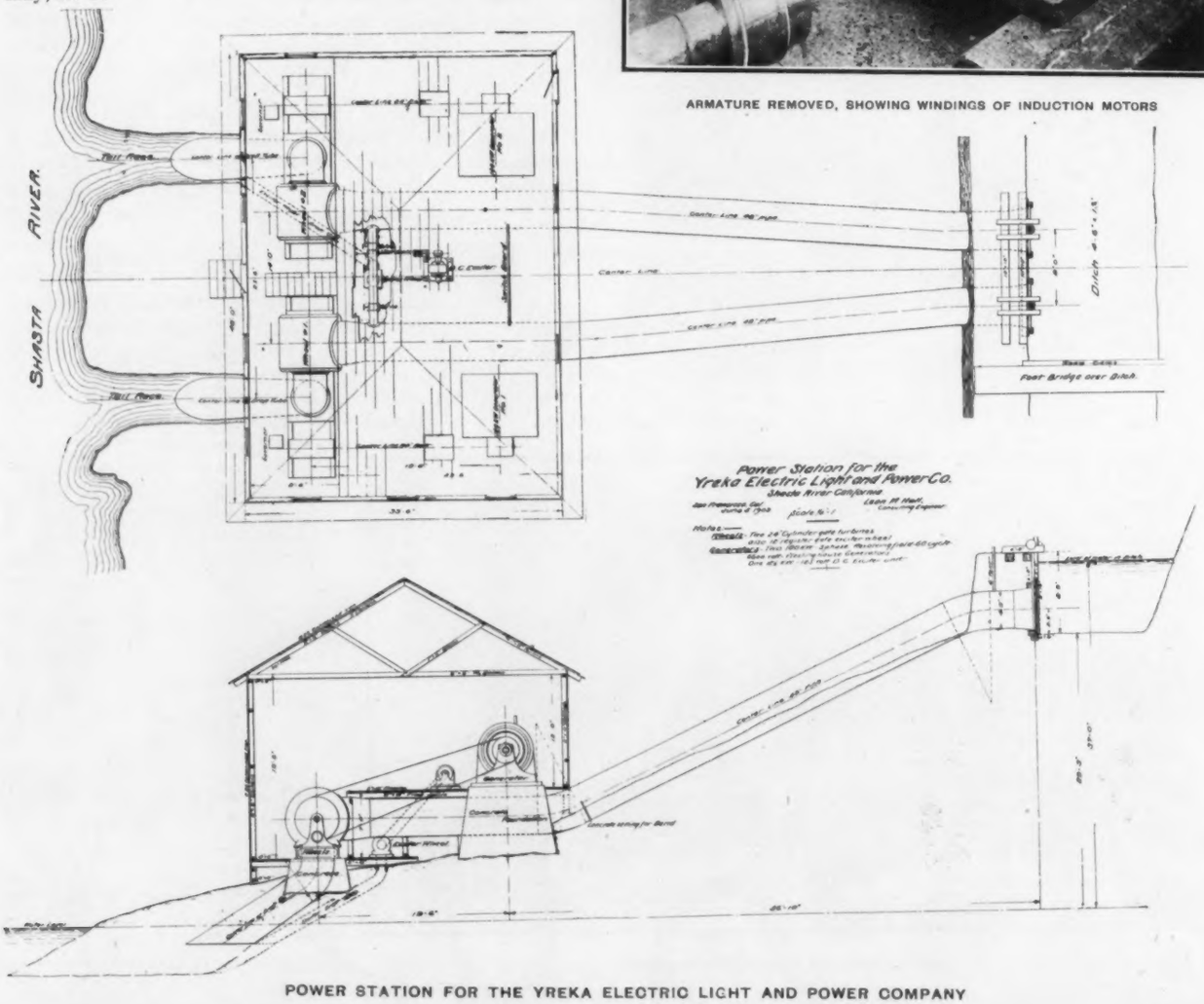
CINCINNATI air and gas compressors are described in Pamphlet L-26-A, just issued by the Laidlaw-Dunn-Gordon Company, of 114 Liberty Street, New York City. These machines are of medium and small sizes. the steam ends being equipped with plain slide valves and Meyer valve gears and the air ends with poppet valves. One of the compressors is of an entirely new type in that the air cylinders are provided both with mechanically moved valves and with poppet valves, all points in the compression cycle being determined by the mechanically moved valves, with the exception of the opening of the exhaust, which is determined by the poppet valves. This arrangement combines the positive action, noiseless operation and durability of mechanically moved valves with the elasticity of poppet valves, at the same time avoiding the noise and rapid wear of the latter. This pamphlet, which is of convenient pocket size, will be sent upon request to those interested.

AN APPRENTICESHIP COURSE.

The General Electric Company has established a drafting room apprenticeship course, to which young men who are able to pass a satisfactory examination in arithmetic are eligible. The course is intended to fit applicants for drafting room positions. Further information can be obtained by application to J. W. Upp, engineer in charge of drafting room, General Electric Company, Schenectady, N. Y.



ARMATURE REMOVED, SHOWING WINDINGS OF INDUCTION MOTORS



POWER STATION FOR THE YREKA ELECTRIC LIGHT AND POWER COMPANY

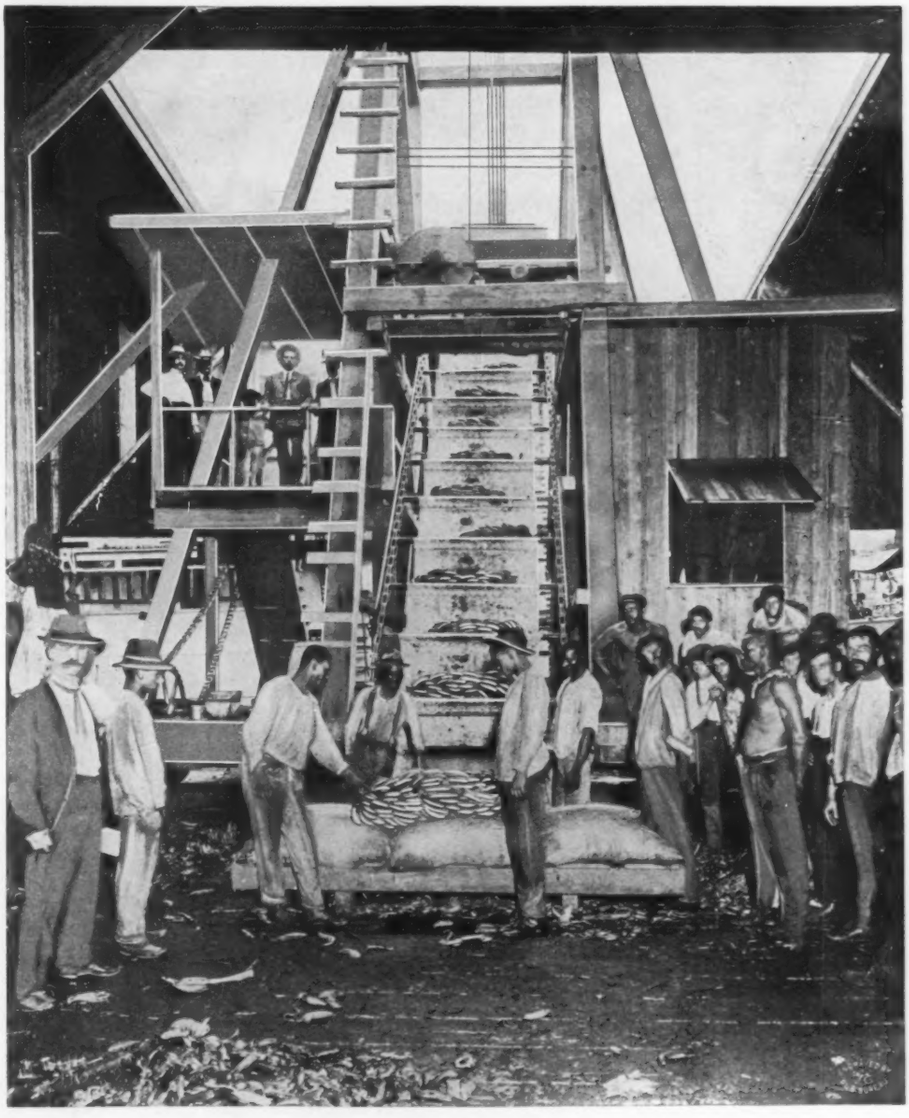
ELECTRICAL MACHINE FOR UNLOADING BANANAS FROM A VESSEL.

THE question of unloading bananas from a vessel in the shortest time and with minimum expense has practically been solved by an electrically operated automatic machine recently installed at the United Fruit Company's wharf at New Orleans, La. This company, with 7,000,000 bunches of bananas to be unloaded during the year, realizes the importance of an automatic machine which would successfully do this work. Heretofore the work has been accomplished by having many negroes stationed in the hold and lifting the fruit from deck to deck and then over the side of the vessel. With this method the fruit was considerably bruised, and the stems badly broken, but with the new machine for unloading bananas, a vessel can be unloaded in one-half the time previously required by hand labor, and perishable fruit can be hurried to the Northern and Eastern markets with a minimum delay.

This machine was built by the Link Belt Manufacturing Company, and was invented and patented by George J. Eddelston and Beverly J. Harris. The machine is operated by a fifteen horse-power induction motor manufactured by the General Electric Company, Schenectady, N. Y. This motor receives its current from the city lighting plant, and has operated with perfect satisfaction. The switches, circuit breakers, etc., necessary for the operation of this motor were also furnished by the General Electric Company.

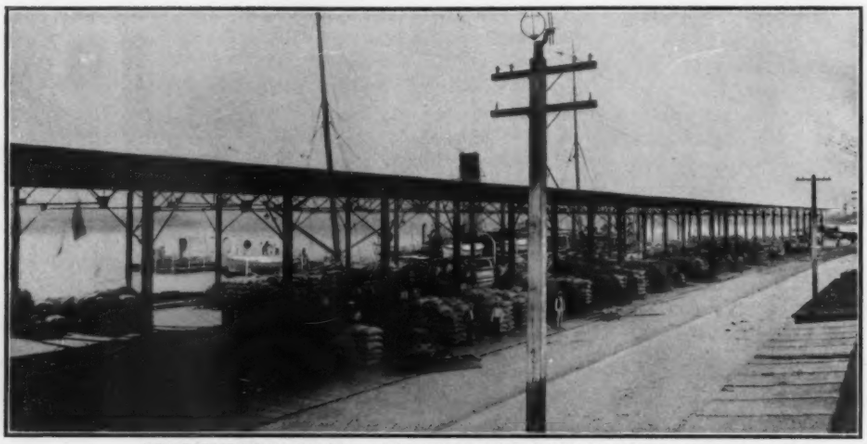
The shape of the machine is somewhat like the carrier of a thrashing machine, such as is used in the wheat belt of the Northwest. It is built upon a platform upheld by ten trucks; from the platform steel booms rise, each in the shape of a hinge which opens and shuts. As the ship is moored to the wharf the hatches are opened and the one end of the machine lowered into the hold. Then the carrier runs up perpendicular some thirty feet and across to the wharf. In the center of the platform on the wharf the wheels are stationed for moving on a rail track laid for that purpose. A lookout tower is stationed on top containing four levers for the entire control of the machine, which may be operated by one man. The levers start or stop the machine by friction gear, move it along the wharf when necessary, and hoist the main boom over the deck of the vessel. The canvas carrier which revolves around pivots, placed at each end of the steel boom, is divided by bars of wood into pockets thirty inches in length and forty-eight inches in width. As the canvas drops into the hold it is located by means of the pocket at each end of the deck and swiftly carries the fruit up the perpendicular boom and across to the wharf. With this machine 5,000 bunches of bananas may be unloaded per hour, and the fruit is not bruised in the least, while the stems are in a perfect condition. With three hatches open and three machines working together, with better facilities for carrying the fruit to the wagons and cars, a rate of eighty per minute on each carrier may be attained, with a total of 15,000 bunches unloaded per hour.

This machine has been experimental, but has proved so satisfactory that the United Fruit Company, according to the New Orleans *Times-Democrat*, will soon install two other machines of the same kind, which will be so arranged that all three can be worked together to unload one vessel or three separate vessels, as the occasion demands.



AN ELECTRICAL MACHINE FOR UNLOADING BANANAS FROM A VESSEL

The steam power plant of the St. Louis Exposition, now being built by Messrs. Westinghouse, Church, Kerr & Co., will be fitted with two large central condensing units, each consisting of a forty-inch elevated condenser capable of handling 96,000 pounds of steam per hour. These condensers are being built by Henry R. Worthington, of New York City, who will supply centrifugal pumps for handling the circulating water. That company will also furnish the rotative dry vacuum pumps which will remove all air from the condenser system. The boiler feed pumps of this immense power plant are likewise of Worthington make



NEW COFFEE DOCK, 900 FEET LONG, WHERE RAILWAY AND STEAMSHIPS MEET

THE CHARM OF NEW ORLEANS.

AMERICAN cities, generally speaking, are as much alike as so many peas out of the same pod, all except our own San Francisco and quaint, picturesque old New Orleans. San Francisco is distinguished from her sisters by her wonderful all-the-year-round climate, her corner of the queer Celestial empire and the freedom of her vivacious people from silly social restraints, in the last of which she is distinguishe l from none so sharply as from New Orleans. The charm of this old southern city lies in a number of things peculiar to herself, first and foremost of which must be mentioned her people, for after all it is the people that give a human interest to any place. Here we have the mingling of many races and tongues, from the flaxen haired Swede, with his harsh gutturals, to the swarthiest of Spaniards and the liquid tongue of Castile, but with the descendants of the Latin race and the French in particular greatly in predominance. And the Latin peoples are famed the world round for their lightness of heart and love of pleasure, as contrasted with peoples of Germanic origin, and for their delicious and never failing courtesey. If you are a stranger, and stop a passer by to inquire your way, half expecting no answer at all, or at best an indifferent "damfino," you are all but paralyzed with astonishment when the other comes to a full stop, politely raising his hat, although you are of the gender masculine, and you hear:

"I beg pahdon, suh?" in the soft patois of the Creole speaking English.

If you survive the shock, you repeat the question, and he promptly reaches for your arm.

"Wiz pleasuher, suh," he says. "Eef djou weel come wiz me, I weel take djou to ze cah."

And what is more he does it, walking perhaps four or five blocks out of his way, and losing fifteen or twenty minutes from his business. Perhaps he has no urgent business, the chances are that he has not, if any at all, but does that detract in the least from the thrill of pleasure that starts in surprise from your startled brain and goes sweeping over your entire system?

Even below Canal Street, which is the most ancient part of the city, the French Quarter, so called to distinguish it from the more modern part above Canal affected by "Americans," there is now a splendid system of electric railway, with commodious cars and first-class service, which enables the visitor to see quickly and economically all the places and things of interest, wh ch are to be found for the greater part in this same queer old French Quarter. Note the extreme narrowness of the streets, and the heavy iron gratings protecting the windows. Stroll about historic Jackson Square, with its bronze equestrian statue of the hero of New Orleans, not forgetting an inspection of the grand St. Louis Cathedral on one side, whither Jackson was escorted in grand march by all the people at the conclusion of the famous battle. Old Hotel Royal, also, with its memories and traditions of the days "befo' de wah," should be visited; and strange Metarie Cemetery, with its lines and lines of hallowed dead buried in massive and beautiful vaults all above ground. The old French Market should be visited in the early morning, not later than six o'clock, after which a stroll along the levee should be taken to view the shipping lying in the great river flowing so majestically past. Do not be afraid of being unable to make yourself understood—English is the language of commerce—and so all speak at least some form of it during business hours.

Going from San Francisco to New Orleans, the route is via the Southern Pacific's famous Coast Line, through San Jose, Santa Barbara and Los Angeles, thence through the orange groves of southern California, following the Sunset Route, across the broad cattle ranges of Arizona, New Mexico and Texas, skirting the historic Rio Grande with its vistas of picturesque Mexican life, through old San Antonio with its memories of the Alamo, at last to enter the cotton fields and rice and sugar plantations of Louisiana.

RECLAIMING DESERTS BY ELECTRICITY.

ONE of the interesting sights which one may see if he visits the country about Los Angeles, Cal., is the transformation of vast plains of sage brush desert into beautiful and profitable groves of orange trees through the medium of electricity.

Stretching for miles away from Los Angeles, both east and west, there is an area of something like 2500 square miles of land on

NEW ORLEANS CRIMINAL COURTS BUILDING AND PARISH PRISON

which nothing grows under natural conditions except sage brush, grease wood, poppies and a little wild mustard. From May to November not a drop of rain is to be expected, and the only crop the ablest farmer could raise on most of this area was an occasional harvest of barley. Sowing this grain in the fall, just before the rains began, it would get a start and mature before the summer drought began and shrivelled it up. Even during the wet season the rainfall is small, being less than twelve inches for the year. Mountains skirt the district, and from these flow streams which

PUMP HOUSE AND IRRIGATION CANAL

are small in volume but contain much energy, because of the heights down which they flow in the rocky canyons. The idea of making the sage plain bloom came from a few clever farmers, who impounded some of the little streams and turned the water upon their lands. Wherever the water went there followed verdure. The climate made the lands ideal for raising oranges under irrigation. The streams, however, were inadequate to supply water to irrigate more than a small area of this vast tract of land. Who it was discovered that underneath the sage plains there was an abundance of water that could be tapped by wells is unrecorded. When this knowledge became generally disseminated, emigrants flocked into the country and wells were sunk in great numbers. They found water in ample quantity at depths ranging from fifty to 200 feet below the surface. Then came the question of how to raise it. Windmills could not be used on account of their unreliability. When a farmer wants water in that country he must have it right away, and a lot of it.

Some farmers put in gasolene and crude oil engines, which are used very extensively; but the real solution came when two power companies went up into the Sierra Madre Mountains, eighty-three miles east of Los Angeles, and harnessed up the streams to turbines and electric generators.

It is doubtful if the projectors of these enterprises realized what a transformation they would make in the arid lands of this section when they undertook the work. Los Angeles itself was the market they were seeking for the consumption of their power. Soon the plain from Los Angeles to the Sierra Mardre Mountains was strung with two lines of poles and wires, and the manner in which the engineers surmounted the difficulties of distance by using electric currents of from 15,000 to 33,000 volts for transmission created wonder even in the electrical world.

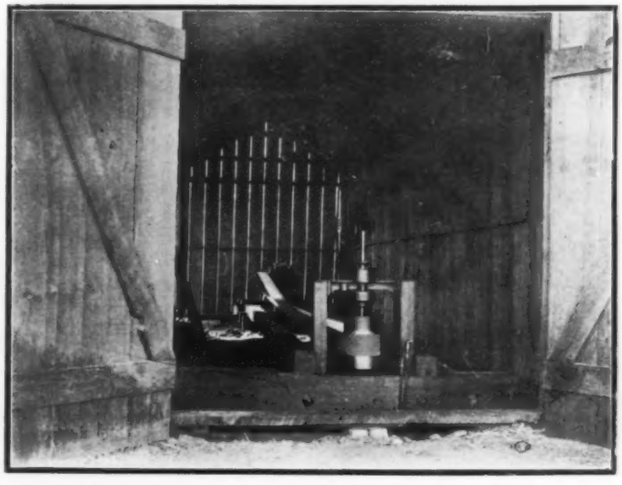
Today these waterfalls are doing work in shops and factories in Los Angeles and lighting streets and houses; but the most wonderful transformation which they have effected is on the plains by irrigation. It did not take the ranchers long to discover that a little electrical current tapped from one of the trunk lines would do their pumping for them with more certainty than anthing else. Today branches run out in all directions from the trunk lines, and hundreds of orange growers are their customers.

The land is mostly taken up in moderate sized ranches of from five to 500 acres, though "Lucky" Baldwin has one big ranch in the sage brush country of 30,000 acres. But whether the farm be small or large the operations are along similar lines. A well is driven for each area of fifty to seventy-five acres. Over the well is built a suitable house and within this is installed a pump and an electric motor. Somewhere in the vicinity the high tension electric line is tapped and wires are taken to the pumping station. Outside the station the wires go to a transformer which reduces the voltage so that it can be used by the motor. Main canals lead from the pumping station to a series of small irrigation ditches with plash boards to direct the water to where it is needed. All the farmer has to do is to fix his plash boards, turn the switch and go about his other business. Within the little station the electric motor buzzes away merrily, drawing a copious stream of water from the bowels of the earth, and this it will continue to do as long as it is needed. When no more water is required the farmer turns the switch again and his expense for current ceases. The plant for the pumping station is of the simplest, the custom being to use small centrifugal pumps and to drive these with a small induction motor. In some places the motor is mounted upon the top of the pump shaft, or else it is set a few feet away and connected to the pump by a belt. Many of these small plants supply as much as 50 to 150 miners' inches of water.

Although irrigation was only begun in this part of the country about three years ago, there are already a large number of electric pumping plants installed.

The lands which were valueless before are now worth from $300 to $500 an acre. After the orange trees come into bearing they often yield as much as the lands are worth in a single season. The demand for electric current has become so great that one of the electric power companies has gone into the mountains 125 miles to the north of Los Angeles and harnessed up the Kern River. Power from that plant will open up new fields for irrigation as well as supplying means for pumping the oil which has been discovered in that section.

Electric current in some parts of this State is also used extensively and at reasonable rates. For instance, the Mt. Whitney Power Company furnishes power or current at $50 a horsepower per year at a twenty-four hour run, so that you can run it one day or 365 days continuously at this flat rate. They also have a rate



INSIDE OF PUMP HOUSE. WESTINGHOUSE MOTOR AND PUMP

of $30 per horsepower per year for a twelve-hour day service. In Los Angeles a rate of 1¾ cents per horsepower-hour is charged, only basing their charges upon the meter reading. From returns of a large number of inquiries it is found that it affords a cheap and reliable power, requiring no attendance at all, some plants running fully twenty-four to thirty days continuously with no trouble or cost of attendance.

The Journal of ELECTRICITY POWER and GAS
DEVOTED TO THE CONVERSION, TRANSMISSION and DISTRIBUTION OF ENERGY.

PUBLISHED MONTHLY BY
The Journal of Electricity Publishing Company
Room 532, Rialto Building, San Francisco, Cal.
Telephone Main 1264.

Official Organ of the Pacific Coast Electric Transmission Association.

Yearly subscription: Domestic, $2.00; Foreign, $2.50; Single Copies, 25 cents.
Subscriptions can not be begun with back numbers.
Manuscripts submitted must be accompanied by postage to insure return.

ADDRESS ALL COMMUNICATIONS AND MAKE ALL REMITTANCES PAYABLE TO THE JOURNAL OF ELECTRICITY PUBLISHING COMPANY.

This paper is a member of the National Trade Press Association.

Entered as second-class matter at the San Francisco Post Office, August 15, 1899.
Entered as *The Electrical Journal*, July, 1895. Entry changed to *The Journal of Electricity*, September, 1895.

VOLUME XIV MARCH, 1904 NUMBER 3

NOTICE.

We beg to announce to the readers of "The Journal" that J. M. Shawhan is no longer connected with this paper. Address all communications to the Journal of Electricity Publishing Company, Room 532, Rialto Building, San Francisco, Cal.

EDITORIAL.

THE CHANGE TO SINGLE-PHASE MOTORS.

One of the startling changes in the electrical field noticeable at the present time is the discarding of the synchronous motor for the single-phase, and the retail sale of the latter on the same plan that gas stoves are sold on the popular installment plan to small consumers. The change of sentiment is remarkable, considering the line of experiments pursued in the past by some of the largest manufacturers of electric appliances, and the failures developed in introducing the single-phase motor for industrial purposes.

In a recent communication to THE JOURNAL one manufacturer says: "We began the manufacture of single-phase power motors very early in 1897, and were confronted with an almost entire absence of demand for such a device. The situation was even worse than this, for the failure of a certain type of synchronous single-phase motors had caught a good many central station companies, and they were not only of the fixed conviction that single-phase motors were a delusion and a snare, but by virtue of the prejudice this motor had created, would hardly listen to reasonable arguments. Our company has worked away on the creation of a demand for single-phase motors steadily and vigorously, being able to realize the almost constant and gradual change of sentiment. One central station after another has swung into line, after being induced to experimentally try our motors. This has gone on for several years without any radical change of sentiment at any given time until a few months ago, when all of a sudden a 'wild fire' sentiment for single-phase motors swept over the entire country. Recently some of the largest syndicates in the East have been conducting experiments with our machines, and the result has been that they have determined to go ahead and develop single-phase motor load to the greatest possible extent."

That the above indicates a radical and important change is demonstrated by the following facts which have been gleaned through various sources:

In Newark, N. J., where the distribution is two-phase, there are quite a number of thirty-five horsepower motors operating with entirely satisfactory results. The company controlling the system has recently adopted as a standard method of distribution automatic regulators for their generator bus-bar voltages, and hand regulators for their individual single-phase feeders. By means of this combination of regulating devices, their actual practical experience has proven conclusively that single-phase motors in practically all sizes so far placed on the market were not injurious to their lighting business, and that therefore they would develop the single-phase motor load to the greatest extent. They are now proposing to install single-phase motors on the popular plan before mentioned.

The Cincinnati Gas and Electric Company last December increased their size restrictions on single-phase motors on all their lighting lines from one horsepower to ten horsepower units, and announced a willingness to take on larger motors where feeder capacity would permit. A number of other cities in the United States are now putting in the same regulations.

With the practical advent of the single-phase railway motor all arguments against the single-phase motor of any description seem to have been thrown down. One of the vigorous points of attack against it has been that the commutator is a distinctly detrimental feature to the single-phase motor owing to its liability to being short lived.

Commenting on this in his paper read before the American Institute in January last, Mr. Schlichter said: "The single-phase commutator motor has attracted considerable attention of late, as there is quite a demand in railway work as well as in numerous other lines for an alternating current motor which will start under a heavy load with a reasonable consumption of energy. At present it appears that a commutator type of motor is the only type which will fulfill these conditions." A little further on Mr. Schlichter also says: "Frequencies of twenty-five, forty and even sixty cycles may be employed." In other words, from the position of condemning the commutator for temporary use they have come to the position of advocating the commutator for continuous use. All of which goes to prove that the single-phase motor has come to stay.

LIVE AND LET LIVE

The Tacoma *Times* sounds the keynote of success in a timely editorial on the alleged throttling of competition to maintain a monopoly. "Keep both concerns going" should strike all citizens of the Northwest with the fact that they have an honest newspaper to depend on. The editorial and article are quoted herewith in full.

FIGHT OF THE ELECTRIC COMPANIES.

The *Times* calls attention to an article printed elsewhere in this issue concerning attempts being made by the so-called Tacoma Industrial Company to force the Snoqualmie Power Company out of the electrical field.

The electric octopus known under various names on Puget Sound, such as the Seattle Electric Company, the Tacoma Industrial Company, etc., is trying to secure an absolute monopoly of supplying light and power in this region of country. It has been persistently fighting Mr. Charles Baker and his associates since the day that Baker undertook to start an independent electrical plant at Snoqualmie Falls. It has followed up its throttling tactics by attacking Baker's White River Power Company, which is intended to be a plant supplementary to the Snoqualmie plant.

The Stone & Webster clique, of Boston, which is behind these assaults on Baker, wants a monopoly. It knows that an increase in power and light prices can only be obtained when the thorn in the flesh—the Baker concern—is put out of the way.

The interests of the public will be best subserved by keeping both Baker and the Stone & Webster people in business. Competition means lower prices for electricity. It would probably be just as bad to give Mr. Baker a monopoly, for he might want higher prices.

Keep both concerns going. Tacoma will profit by it.

THROTTLING PROCESS OF ELECTRIC OCTOPUS DEMANDS PUBLIC NOTICE.

Editor the Tacoma Times:

SIR—The case of the White River Power Company against the Tacoma Industrial Company (Seattle Electric Company), decided by Judge Huston in favor of the power company, has gone up on appeal to the Supreme Court of this State, and until it is settled in that tribunal it is not thought that the White River Power Company will prosecute its construction operations upon a very extensive scale. A peculiar and unfortunate feature of this situation as regards the public is that if the Tacoma Industrial Company succeeds in destroying the property of the White River Power Company through the agency of the courts, they will practically destroy the river for their own use as well.

Their principal point of contention against the White River Power Company is a technical one, namely, that the power company is not endowed with the power of eminent domain and has no right of condemnation. If the court holds to this view, of course the same theory will apply to the Tacoma Industrial Company or any other public servant company now created or which may hereafter be created in this State for the purpose of improving the rivers for industrial and manufacturing purposes for the benefit of the people.

The engineering plan of the power company makes possible the development of 100,000 horsepower in White River. The Industrial company's plan, according to their testimony, makes possible the development of 10,000 horsepower, upon the same river, and using the same amount of water. The more extensive output of the power company's plant is due to the fact that their head of water or fall is three times greater than the Industrial company's, and to the further fact that they have a natural storage reservoir at their command of 4000 acres, which they can draw down thirty feet, thus enabling them to impound the flood waters in the river and to pay out the same during the period of minimum flow of the same, thus augmenting the minimum flow to three times what it naturally runs.

It is indeed a pity that so worthy an enterprise should be held in abeyance by the selfishness of a company which seeks to destroy it, while during all this time the industrial development of the country is held in check and peeple who desire to establish industries and who are clamoring for power must patientiy await the settlement of this petty attack upon a worthy project before they can carry out their plans.

CITIZEN.

A NORTHERN TRANSMISSION

Continuing discoveries for the past six years have demonstrated the vastness and richness of Seward Peninsula, Alaska, as a gold field. The mint returns for the past year prove it to be the greatest placer mining section of the United States, if not of the world.

Into this great field, heretofore mined in the most crude and expensive manner, a new factor is about to enter that will multiply its output many times and render workable vast areas of rich ground that heretofore have been wholly unavailable by reason of the scarcity of hydraulic water and the very high price of fuel and wages.

It was an unexpected discovery last year that forty miles north of Nome water sources with a capacity of 100,000 horsepower existed on the north side of the Sawtooth Mountains. These water powers are now to be converted into electricity, which will be transmitted to the mines all over the peninsula for hydraulic uses.

From an electrical point of view this enterprise is thoroughly practical, and its development will be followed with keen interest by electricians. It will have the distinction of being the farthest north of all transmission lines. Devoted almost exclusively to the production of gold, in a field where gold is plentiful, it should prove one of the most, if not the most, profitable transmission plant in the world.

THE ANNUAL NUMBER.

The annual number of THE JOURNAL OF ELECTRICITY, POWER AND GAS constitutes a valuable contribution to the journalistic record of the progress of San Francisco along all lines of industrial development. The number is creditable not only to the management of THE JOURNAL, but to the city as well; for it affords evidence that in our structural work and in our use of electrical energy and electrical appliances we are abreast of the most progressive cities of the age. There is no longer any doubt that electricity is to furnish most of the artificial power and light used by civilization in the immediate future; but comparatively few people realize to what extent it already provides for the needs of the city in those respects. The various articles of this annual of THE JOURNAL will, therefore, furnish something of surprise to its readers, for while it is in no sense of the word a "boom" number, it nevertheless shows San Francisco in a manner that will increase her prestige as a city of light and energy.—*San Francisco Call.*

The annual number of THE JOURNAL OF ELECTRICITY, POWER AND GAS is devoted this year chiefly to the development of electric railroading on the Pacific Coast, particularly in California. It contains exhaustive descriptions of the North Shore third-rail electric railway, the Los Angeles system of electric railways, the electric system of the United Railroads of San Francisco, the San Mateo line, and the Oregon Water Power and Railway system of Portland. It is splendidly illustrated, well printed and carefully edited, and will be prized by every one who is interested in the latest developments in the electrification of railroads.

PUBLICATIONS.

"AMERICAN METER PRACTICE," by Lyman C. Reed. Cloth, 5½x8¼ inches; 196 pages, 78 illustrations. Published by the McGraw Publishing Company, New York. Price, $2.00.

Here is an author who takes an everyday matter of central station practice—a matter which, by its very commonplace familiarity, is apt to be much further down the scale of consideration than its importance warrants, and treats it with a thoroughness that bespeaks long familiarity with it. Indeed, the subject of metering the output of central stations appears to have been to him one of the most interesting problems which arise in the development of the supply of electricity for various commercial needs, and so impressed is the book with this idea, that its every page marks the view of a specialist of no mean repute. There are minor details omitted in the work which would doubtless be of interest to the practical worker in meters, but it is clear that the aim of the author has been to outline the underlying principles of operation and practice and to leave the lesser details to be worked out to suit local conditions.

The introductory chapters very properly treat of the measurement of electric power, there being considered successively the basic principles underlying the measurement of power in direct-current circuits and in alternating-current circuits, which naturally include all classes of polyphase work. So simply expressed are the reasonings there set forth that it is hard to conceive how it would be possible to explain them with more conciseness and lucidity. In no case does the author dodge a fact. The virtues and the faults of meters in general, as well as of specific classes, are discussed frankly and honestly, so that the reader at once becomes inspired with a conviction of his impartiality. A single quotation illustrates this invaluable feature of the work. In discussing the use of meters in Edison three-wire services, it is stated, on page 15, that "the shunt field coil, where a single meter is employed (in measuring the energies of a three-wire circuit), can be fed from across the outsides, or between the neutral and one outside. In either arrangement, unless the voltage be equal on both sides of the system, an error is introduced into the record proportional to the difference of voltage existing. To obtain a true record, if the voltage be unequal, it is necessary to employ two two-wire meters or a three-wire meter having two armatures fed respectively from each side of the system." Then it is pointed out that this latter arrangement amounts to the combining of two meters under one cover, resulting in a clumsy and expensive device. "In commercial practice," the author continues, "the voltage on one side of a three-wire distributing system is usually maintained about equal to that of the other, the errors resulting from inequalities of the sides supposedly balance, so that it is the usual practice to meter with a three-wire meter with the shunt field coils fed between the two outsides, or between one outside and the neutral." Thus is given, so that all may understand, the exact infirmity of three-wire metering under methods which are prevalent, together with the suggestion of a rational method of eliminating the error, if exactness under conditions of unbalanced load, as well as under balanced load, is to be attained. This is but a single instance of the many which the book contains going to prove the author's fairness and fearlessness.

The introductory chapters on the measurement of power are followed by two others which treat, respectively, upon the requisites of a good meter and the commercial considerations, accompanying the selection of a type of meter, and upon torque and friction. Then follow several chapters which are descriptive of meters, in writing which it is the author's evident object to select one each of well-known and representative types of meters for description, without wearying the reader by reciting the same characteristics held by a number of meters of the same type. In fact, in the preface, the author expressly disclaims any intention of slighting in any way the many excellent meters which he mentions, but does not describe, stating that the meters selected for description have each some distinguishing feature which makes them representative of as many respective classes. Following out this idea, there are described in as many chapters the Edison mechanical meter, the Thomson recording wattmeter, the Duncan alternating-current wattmeter, the Stanley recording wattmeter, the Guttman wattmeter and the Westinghouse induction meter.

In this connection it is interesting to note some of the expressions which the author gives upon these various meters:

"With proper manipulation and care," the Edison meter "proves a wonderful accurate meter in service." [Page 59.]

"The extended use" of the Thomson recording wattmeter "has been in a great measure due to its being practically the only meter in the market for direct current, and to its further adaptability to all forms of service. Its ability to register either direct or alternating current, whether the former be inductive or non-inductive, without change of calibration, makes it especially suitable to the needs of central stations furnishing different kinds of current." [Page 67.]

The Duncan recording wattmeter for alternating currents "may be taken as a type representative of quite a number of meters, such as the Schallenberger, Schaeffer, Guttman, Packard, all of which employ similar principles, but, of course, differ in mechanical details. All of the above, however, have a spring-mounted jewel for the armature support in common. In this one point all these types of meters fail to fulfill ideal conditions, by having a variable frictional support for the armature which changes rapidly for the worse with ill usage. The torque in this type of meter is unusually small, but the ratio between torque and fractional equivalent may be large when the meter is new, and a very accurate register of load through large loads may be obtained. The meter is not absolutely air-tight, and it is subject to all objections which this implies." [Pages 88–90.]

The Duncan commutated type of wattmeter for direct currents is such that "its electrical and mechanical design insure for it a lasting place in the commercial field. The motor is of the non-inductive type and can be used to register direct or alternating currents with equal accuracy." [Page 91.]

The Stanley recording wattmeter "promises to fill more fully the requisite of a good meter than any other type, owing to the permanence of its fractional equivalent." [Page 111.]

"The Guttman wattmeter in its present form possesses considerable merit, and has a very pleasing mechanical appearance." [Page 113.]

The Schallenberger ampere-hour meter "has become obsolete in modern practice, although it may still be found connected in a number of instances." [Page 119.]

"The torque of the Westinghouse induction meter is small, but large in proportion to the weight of the revolving element, which is unusually light. The ratio between torque and friction of the meter is large, hence the great degree of accuracy obtained over a wide range of loads and on extremely light loads." [Page 123.]

The five chapters which close the book possess interest of a general trend, for they discuss the management of the meter department of central stations and kindred matters pertaining to general policy, records, testing, reading meters, differential ratings and the importance of losses in meters relative to income. Of the final chapter, that on "Elements of Photometery," it must be said that its introduction into the present work savors of hobby riding, and as such it is an indulgence which even the author's apology that "the measuring of candle power is closely allied to the measurement of current and is properly included in the same discussion," does not condone. Photometry, like the art of illumination, is far too broad a subject to be tagged on to the coat tail of any other theme, in view of which it seems that Chapter XVI might well be omitted from this otherwise excellent book. At the same time let the hope be expressed that its future editions will not be without a carefully compiled table of contents, for in this busy day few will find patience, in looking up a special topic, to be confronted with a bare and impotent list of chapter headings where he should find a detailed index.

UNITED STATES CIVIL SERVICE EXAMINATIONS.

[No. 297]

CONSTRUCTING ENGINEER, RECLAMATION SERVICE, GEOLOGICAL SURVEY

The United States Civil Service Commission announces an examination on April 1, 1904, to secure eligibles from which to make certification to the position of constructing engineer in the Geological Survey, at salaries of from $3600 to $4800 per annum.

It will not be necessary for applicants to appear at any place for examination.

The examination will consist of the subjects mentioned below, which will be weighted as follows:

Subjects.	Weights.
1. Educational and technical training	10
2. Professional experience in general engineering	20
3. Professional experience in construction	50
4. Technical description, in detail, of the most important piece of engineering work done under the competitor's supervision	20
Total	100

Age limit, 20 years or over.

It is desired to secure in the positions to be filled engineers who have achieved wide professional reputation in connection with hydrographic or hydraulic work. It is expected that in rating the papers of the examination the Commission will be assisted by a board of eminent engineers. Persons whose experience is not of the character indicated cannot become eligible as a result of this examination.

This examination is open to all citizens of the United States who comply with the requirements. Competitors will be rated without regard to any consideration other than the qualifications shown in their examination papers, and eligibles will be certified strictly in accordance with the civil service law and rules.

Persons who desire to compete should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 304 and special form, which should be properly executed and, with the material required, filed with the Commission at Washington prior to the hour of closing business on April 1, 1904. In applying for this examination the exact title as given at the head of this announcement should be used in the application.

Issued February 18, 1904.

[No. 211]

ENGINEER DRAFTSMAN, SUPERVISING ARCHITECT'S OFFICE.

The United States Civil Service Commission announces an examination on April 6, 7, 8, 1904, to secure eligibles from which to make certification to fill two vacancies in the position of engineer draftsman, one at $1400 and the other at $1600 per annum, in the Office of the Supervising Architect, and other similar vacancies as they may occur.

The examination will consist of the subjects mentioned below, which will be weighted as follows:

Subjects.	Weights.
1. Mathematics (pure mathematics up to and including calculus, with special application to the class of work to be done)	25
2. Materials and design (comprising knowledge of steel, iron, fireproofing, etc., and design of columns, girders, trusses, etc.)	40
3. Drawing (involving ability to draw designs neatly to scale, tracing, etc.)	15
4. Educational training and experience	20
Total	100

Three days will be allowed for this examination.

Age limit, 20 years or over.

This examination is open to all citizens of the United States who comply with the requirements. Competitors will be rated without regard to any consideration other than the qualifications shown in their examination papers, and eligibles will be certified strictly in accordance with the civil service laws and rules.

Persons who desire to compete should at once apply either to the United States Civil Service Commission, Washington, D. C., or to the secretary of the local board of examiners, for application Form 1312, which should be properly executed and forwarded to the Commission at Washington. In applying for this examination the exact title as given at the head of this announcement should be used in the application.

Persons who are unable to file their formal applications and who notify the Commission of this fact, either by letter or telegram, with the request that they be permitted to take the examination, will be examined, subject to the subsequent filing of their applications, provided their requests are received at the Commission in sufficient time to ship examination papers.

Issued February 19, 1904.

PERSONAL.

The annual conference of the branch office managers of the Standard Underground Cable Company with the general sales, the manufacturing, the construction and the executive departments of the company, was recently held in the general offices of the company in the Westinghouse Building, Pittsburg, the session covering three days. The report of each manager for the year 1903 and the business prospects for the year 1904 were presented and issued, together with ways and means for rendering more efficient service in every department to the customers of the company, who now number considerably over 1000. A pleasant social feature of the occasion was a theater party given by J. W. Marsh, vice-president and general manager of the company, to the visiting managers. The branch office managers attending the meeting were Charles J. Marsh and George L. Wiley from the New York office, Frank Clark Cosby from the Boston office, T. E. Hughes from the Philadelphia office, and J. H. Wiley and E. J. Pietzcker from the Chicago office.

T. H. Bailey Whipple has returned to the Sawyer-Man Electric Company and will resume the position which he left last summer in order to take a part in the reorganization of the sales department of the Nernst Lamp Company of Pittsburg. Mr. Whipple is an old hand in the commercial end of the electric lighting field. He was general sales agent with the Buckeye Electric Company of Cleveland, Ohio, and held a similar position with the Jandus Electric Company, which was an offshoot of the Buckeye Electric Company, and during his connection with these two companies he established most of their agencies throughout the United States. Early in 1903 Mr. Whipple went to the Sawyer-Man Electric Company, where he remained until he was called, as above noted, to the Nernst Lamp Company.

The Brooks-Follis Electric Corporation will hereafter be under the management of Mr. Fowden, formerly with the General Electric Company of this city. Mr. Fowden's great popularity was amply illustrated by a banquet tendered him by his former associates. He has every requisite to make his new venture a marked success, and starts out with the best wishes of a host of friends.

L. M. Hancock, who was so long connected with the California Gas and Electric Corporation, has just returned from a four months' trip to New Zealand, where he has been examining water powers of the colony for the government. He reports a most delightful trip from start to finish.

REMOVAL NOTICE.

IT gives us pleasure to announce that Heald's School of Mines and Engineering, having outgrown its quarters at 24 Post Street, has taken the entire new building No. 130 Union Square Avenue, where it is now installing steam and gasoline engineering apparatus in addition to its former equipment. In its new quarters it has room for the growth which is its due. The city and especially the electrical people of this coast are to be congratulated upon possessing a school so well equipped with room, apparatus and talent.

INDUSTRIAL

THE ALLIS-CHALMERS COMPANY.

CHICAGO, ILL., February 19, 1904.

Journal of Electricity, Power and Gas,
Rialto Building, San Francisco, Cal.:

GENTLEMEN—We beg to notify you that our company has widened its scope of manufacture and engaged in most important industries. We could not give you the information at an earlier date, as we have only just concluded final arrangements for all the new industries we are to engage in, which we are pleased to enumerate as below:

A. Steam turbines.
B. Hydraulic machinery.
C. Gas engines.
D. Electrical machinery.

As regards steam turbines, we have become associated with and form part of the Steam Turbine Advisory Sydicate, of England, which is composed of the Yarrow Shipbuilding Company, of England; Tweedie (Vulcan) Shipbuilding Company, of England; Willans & Robertson, engineers and well known engine builders, of England; Mr. Fullager, formerly chief engineer Parsons Steam Turbine Company, of England, now consulting engineer for Steam Turbine Advisory Syndicate; Allis-Chalmers Company.

Our turbine is of the horizontal type, which is the Parsons type of England and Brown Boverie of Switzerland manufacture. We are convinced, after an investigation by our engineering staff in Europe and elsewhere extending over a period of two years, that we have a steam turbine that is at least in efficiency and economy equal to the best make of Parsons or Curtis, which are the two types most known. We are now prepared to enter into the building of steam turbines of 500, 750, 1000, 1500 and 5000 kilowatts, and can, if required, build up to units of 10,000 kilowatts. The largest size that has ever been built of any type of turbine is 5000 kilowatts. Our license from the Advisory Turbine Syndicate concedes to us all of the United States, Canada and Mexico, with equal rights and privileges in South America, and rights to do business elsewhere in the Western Hemisphere.

We have concluded arrangements with Escher-Wyss & Co., of Zurich, Switzerland, whereby we become the sole licensees for the Western Hemisphere of their famous hydraulic machinery, several types of which have been installed at the Niagara Falls plant of the Cataract Construction Company aggregating 85,000 horsepower. Escher-Wyss & Co. have long enjoyed, and still enjoy, the reputation of being the best known manufacturers of turbines in the world. We only mention Niagara Falls as one of the plants employing thousands of horsepower installed by Escher-Wyss & Co.

We have bought the American patents, and have become sole licensees for the Western Hemisphere, of the Nurnberg Machine Company, Nurnberg, Germany, for their gas engines, and are now prepared to make gas engines up to any required horsepower. At the present time we are prepared to build gas engines from 250 to 1500 horsepower. These engines are suitable for consumer gas or taking the waste gas from blast furnaces and utilizing same with economy and efficiency. It is in the blast furnace trade that we expect the largest business to result. The engine is not an experiment, engines of 1500 horsepower now being in operation in Germany, and it was after two years' investigation by our engineering staff of the various gas engines that we selected the Nurnberg, and have engaged in its manufacture. It is a prime mover, either for blowing engines in blast furnaces or for direct connected dynamos in generating electricity, or for any other purpose where power is required.

We have engaged in the manufacture of generators, motors and electrical apparatus in all its branches, both for stationary and railroad work, power house installation for transportation purposes and electric lighting. We have engaged to take charge of this department of our business Mr. John F. Kelley, formerly of the Stanley Electric Company, Mr. William Stanley, of the same company, as consulting engineer, and Mr. John H. Kelman, formerly superintendent of the Stanley company, as superintendent of this department. In addition we have engaged others of the late Stanley company's staff whose services we can use, and have drawn a further supply from the best electrical engineering establishments in this country and in Europe, so we are fitted out with a complete engineering staff in every branch of the electrical business, and we believe that Messrs. Kelley and Stanley are recognized in the profession as standing equal to the best.

From the above you will observe that we have entered the field not only in the line of prime movers, embracing reciprocating engines, in which field we have always led, but also with steam turbines, gas engines and hydraulics, and with electrical apparatus combined with any one of these prime movers we are now prepared to estimate upon and accept contracts for complete plants of all description and furnish the best of their respective kind.

Yours truly,

ALLIS-CHALMERS COMPANY,
By W. J. Chalmers, Vice-President.

HIGH PRESSURE GAS DISTRIBUTION BY GAS POWER.

A GAS power installation of exceptional interest is now under construction by the Laclede Gas Light Company, of St. Louis, Mo. This system has for its object more efficient distribution of gas over larger areas than may be economically covered by the simple method of running large low pressure mains from a centrally located gas generating plant to supply all parts of the city. The system under construction is intended to supply the entire city of St. Louis, embracing an area of approximately sixty-five square miles.

It is evident that in order to serve the outlying districts of such an area one of three methods must be employed: First, large low pressure feeder from central holder to center of district to be covered; second, medium sized feeders from main holder to auxiliary holder in center of district; and third, high pressure feeder to distributing center, using pressure reducing valves at this point for obtaining proper pressure upon the service lines. The enormous expense for construction entailed by the first two methods has practically prohibited their use in St. Louis, and the high pressure system is being installed. With this system the size of feeder pipes is greatly reduced and the necessity of auxiliary district holders is entirely done away with.

For serving suburban communities, lying far beyond the city limits, this method may be extended and the pressure of the gas raised to any desirable extent for transmission through small pipes, this pressure being reduced at the suburban distributing center by pressure regulators, as in the medium pressure system above mentioned.

This gas distribution system as a whole presents a striking similarity to the ordinary alternating current distribution system with primary high pressure feeders, reducing transformers and secondary low pressure distributing lines, the theory of high pressure transmission being in both cases identical.

The pressures to be employed in the system under construction at St. Louis are approximately five pounds per square inch for the medium pressure feeders and from twenty to eighty pounds per square inch for the high pressure suburban feeders. On account of the use of cast iron mains the five-pound limit was chosen for the medium pressure system; but for the high pressure system iron pipe with screwed fittings will be used. With this construction any desirable pressure may be carried with entire safety and the radius of distribution extended to 100 miles if necessary.

In the medium pressure system the gas pressure will be supplied by a blowing unit, consisting of a standard Connersville blower

direct driven by a 300 horse-power, Westinghouse, horizontal gas engine. The engine is of the type recently brought out for high power work, and embodies a number of newly developed features which distinguish the construction of the horizontal type. Theengine has two double acting cylinders, sixteen and one-half inches in diameter and twenty-four inches stroke, arranged in tandem with a single crank. The engine uses for fuel the ordinary illuminating gas, such as is distributed to customers, and draws its supply directly from the gas main. The engine operates upon the four-stroke cycle, and the method of governing secures a constant quality of explosive mixture at all loads, the quantity being proportioned by the governor to the load on the engine. Electric ignition is employed.

In this particular installation the engine is controlled by an automatic pressure governor which adjusts the speed of the unit in direct proportion to the demand for gas, the speed thus being in inverse proportion to the pressure in the distribution main. So sensitive is this control that the variation in pressure will not exceed eight ounces for a 50 per cent. range in gas output. The regular centrifugal speed governor is, however, also used in order to prevent, under any condition, the engine running at excessive speed.

The St. Louis installation is one of the first of its kind in the illuminating gas field, and presents many interesting features which will be subsequently brought out in special articles at the completion of the work. The system has, however, long been in successful use in the distribution of natural gas over large districts adjacent to natural gas fields. The St. Louis system is in charge of W. A. Baehr, engineer of the Laclede Gas Light Company.

INDUSTRIAL

A NEW CARBON BREAK CIRCUIT BREAKER.

SINCE the introduction of circuit breakers for the purpose of automatically interrupting currents at any predetermined point, manufacturers of electrical apparatus have been constantly engaged in an effort to produce appliances which will break abnormal currents with the greatest degree of regularity of action and the least damage to the breaking device.

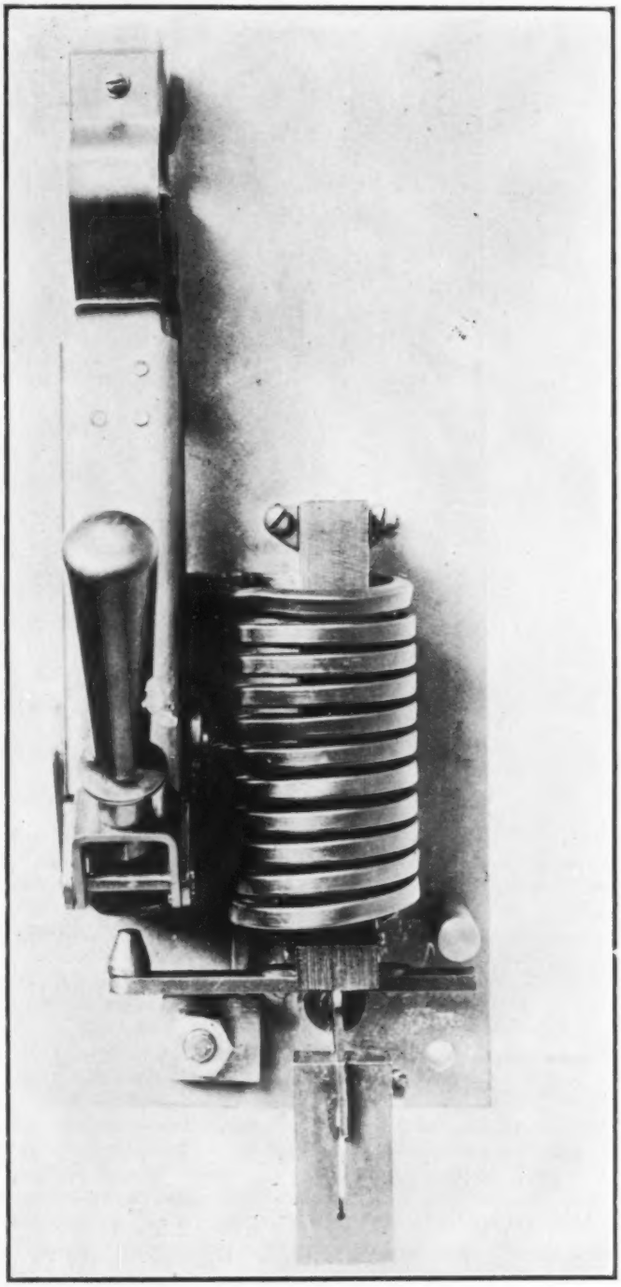
Various means have been employed for minimizing the effect of the final arc since the introduction by the Westinghouse Electric and Manufacturing Company of the first circuit breaker, in which the current was shunted from the main contacts to renewable carbon arcing tips and there broken without injury to the current carrying portions of the appliance. This feature found such ready and general favor that it has since been adopted by the various makers of such apparatus.

The original circuit breaker of this type, now known as the Westinghouse type A, has two breaking points. Soon after its introduction the Westinghouse company evolved and placed upon the market the single break, or brush type, of circuit breaker, as exemplified by its present types B and C, in both of which carbon arcing tips are used. This construction, also, has come into general use, and in various forms is found in the devices offered by the different manufacturers.

The constantly growing demand for a high grade automatic circuit breaker, to be sold at a popular price, led to a still further development of existing types, and as a result the type D circuit breaker has made its appearance. In this device the current is shunted to carbon arcing tips and there ruptured as in the original Westinghouse type A, and the single break is used as in the Westinghouse types B and C, the construction being such as to gain the highest degree of efficiency from these and other features employed.

The type D circuit breaker is designed for use upon circuits not exceeding 250 volts. Its distinguishing feature is the simplicity of its construction. As will be noted from the illustrations there is no complicated or hidden mechanism, the entire device being open to inspection. It is small and compact, and thus occupies but little space. There are but few parts, and the most of these are made from punchings, combining strength, lightness and smoothly finished surfaces at a cost which enables the makers to adopt popular prices. There are no springs to get out of order, the only thing of this kind being the flat strip which carries the carbon arcing tip, and which also serves to throw back the movable arm when the breaker is opened. All screws are locked and the adjustments are few and permanent.

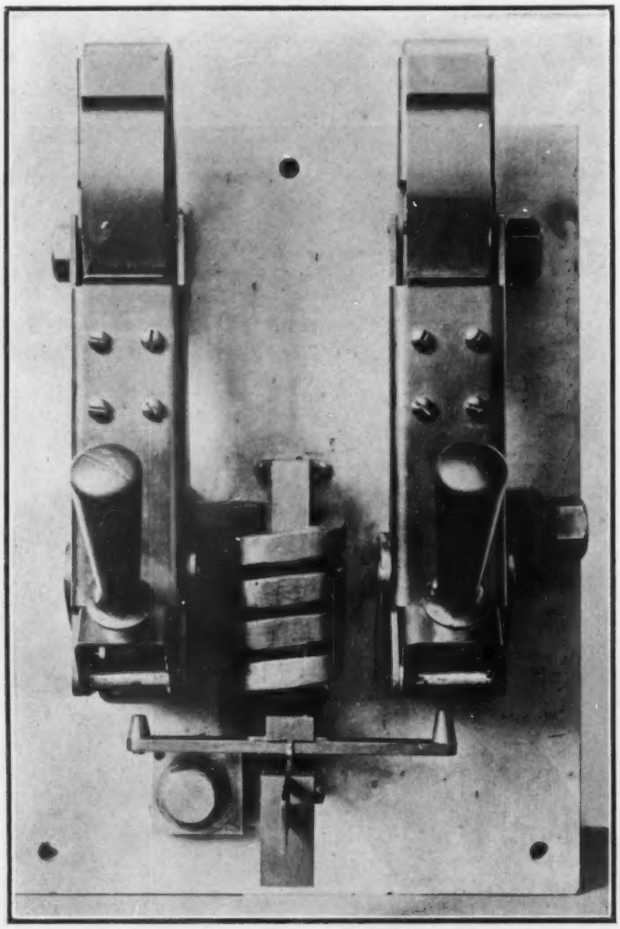
The movable contact is a laminated brush made from the best leaf copper and protected by a copper shunt, and so arranged that when the breaker is opened the current is shunted to the carbons above. The arc occurs when the final break is made on the carbons, the construction of the contacts aiding the natural tendency of the arc to rise, and preventing it from being communicated to the other live parts. Flexible braided leads carry the current



SINGLE POLE TYPE D CIRCUIT BREAKER, OVERLOAD RELEASE

from the movable contact brush to the terminal, thus reducing the number of movable current carrying contacts to a minimum. The temperature rise of the contacts is, in consequence, never over 20 degrees centigrade with a normal current.

The breaking mechanism is simple. The current passes through a coil through which is thrust one pole of a laminated iron horse-



DOUBLE POLE TYPE D CIRCUIT BREAKER CLOSED

shoe electro-magnet. The armature is attached to the other pole of the magnet, and is so placed that a current sufficiently strong will draw up the free end of the armature, a movable counterpoise serving to vary the amount of current required. When the armature is drawn up, contact points attached to it strike the toggle joints which hold the breaker closed and the circuit is opened. If it be desired it can be opened by hand at any time in the same manner as an ordinary switch. The type D circuit breaker is made with one, two, three or four poles, thus covering all the requirements for alternating current and direct current circuits.

The single pole breaker is recommended for use upon motor or lighting circuits when a switch is used in series to complete the circuit after the breaker has been closed. The two pole breaker is used to interrupt the current simultaneously in both wires of a two wire circuit. The two poles are closed independently. A switch to complete the circuit is not necessary, as the tripping mechanism is so designed that a short circuit or an overload will cause the first pole closed to open immediately upon closing the other. This feature combines the functions of two devices at practically the cost of one, with added convenience and saving of space.

INDUSTRIAL

The three pole circuit breaker for use upon three wire direct current or three-phase alternating current circuit, and the four pole circuit breaker for two-phase alternating current circuit are both so arranged that the poles are closed at the same time by the same handle and tripped simultaneously, either by hand or by tripping coils.

As regularly made, the type D circuit breaker has front connections, as shown, but when desired for switchboard mounting a threaded copper stud for rear connections is substituted. It is neatly finished in black oxide and presents an attractive appearance.

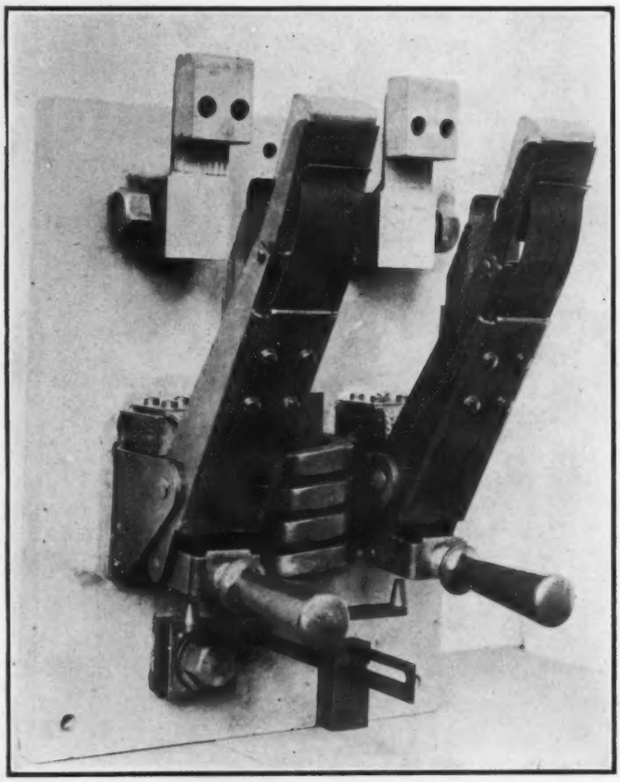
STANDARD UNDERGROUND CABLE COMPANY'S ANNUAL MEETING.

THE annual meeting of the stockholders of the Standard Underground Cable Company was held at the general offices of the company in the Westinghouse Building, Pittsburg, Pa., on January 26, 1904.

The statement of the company's operations for the year was presented, showing that the company did a gross business of nearly $9,000,000 during the year 1903, and that dividends were paid on its capital stock aggregating 12 per cent.; and that the company's assets reach the handsome sum of $3,604,344, with only $375,344 of liabilities, apart from capital stock. It has no outstanding notes, mortgages, bonds or preferred stock.

The board of directors elected for the ensuing year is as follows: Mark W. Watson, John B. Jackson, James H. Willock, Robert Pitcairn, J. N. Davidson, John Moorhead, B. F. Jones, Jr., Joseph W. Marsh and W. A. Connor. The only change in the board is represented by the election of W. A. Connor, who has been at the head of the manufacturing department of the company since 1884.

The meeting of the board of directors for the purpose of organization was held on the 29th inst., and the former officers were re-elected as follows; Mark W. Watson, president. Joseph W, Marsh, vice-president and general manager; Frank A. Rinehart,



DOUBLE POLE TYPE D CIRCUIT BREAKER OPEN

treasurer, and C. M. Hagen, auditor.

This company was the pioneer in the manufacture of underground cables for all classes of electric service, having been formally organized in January of the year 1882, although much experimental work was done by Richard S. Waring, the founder of the company, prior to its organization. Its reputation for high-class manufacture in each of its departments, comprising bare copper wire, weatherproof wires and cables, rubber insulated wires and cables, and both paper and rubber insulated lead covered cables for telephone, telegraph, electric light and power service, together with the favorable location of its factories—Perth Amboy, N. J., Pittsburg, Pa., and Oakland, Cal.—and its strong financial condition, place it in a most favorable position to command a large business in its various lines.

INDUSTRIAL

THE JOHN R. COLE COMPANY.

OWING to a demand for larger quarters, and also the intention to carry a very large stock of their different agencies, the John R. Cole Company have removed from their old quarters at 33 Second Street to the three story building at 658–660 Mission Street, San Francisco. They have handled the following accounts with such success during the past ten years that the factories for which they are the Pacific Coast agents have arranged for them to carry a complete stock of goods. This concern represents the following well known manufacturers:

The American Circular Loom Company, Chelsea, Mass., who manufacture the well known rigid steel enameled conduit and the circular loom flexible conduit, and carry a complete stock of both conduits in San Francisco. Also the Bossert Electric Construction Company, Utica, N. Y., who manufacture the well known Bossert steel knockout boxes for making a complete conduit installation. The number and variety of boxes which they manufacture has met nearly every condition which has arisen in a conduit installation. They also manufacture the well known Monitor bushings and checknuts and Bossert panel boards, with boxes and covers for the same; also a line of Bossert knife switches. The great success which they have had with all of the above articles has been strictly on the quality and workmanship in manufacture. They are generally known as Government Standard. A complete stock of boxes and bushings and checknuts are carried in San Francisco.

They also carry a complete stock of Cutter Electrical and Manufacturing Company's C–S flush switches, including plates, boxes, etc., and the fact that this switch is built on the very finest mechanical lines has created such a demand for it that it is conceded by all users to be the very best switch on the market. The Cutter company also manufacture the well known I–T–E circuit breakers, which are acknowledged by all engineers to be the only thoroughly reliable circuit breaker in the market. They also carry the well known Keystone switchboard instruments, which by many tests have proved themselves to be the very highest grade instruments on the market.

They represent the Akron Smoking Pipe Company, who are manufacturers of the very highest grade porcelain bushings, knobs, cleats, etc. This company is now experimenting and propose to place on the market high voltage porcelain insulators, which they will bring to the notice of the trade just as soon as their experiments and other data are completed.

On rubber covered wires they represent the New York Insulated Wire Company, who, as manufacturers of Grimshaw white core and Raven white core, have enjoyed a very large percentage of the trade in this territory, and all users of their goods state that they consider its rubber covered wires are the very finest in the market. They also manufacture the well known Grimshaw black and white tapes, Competition black and white tapes, Grimshaw and Competition splicing compounds. One of the specialties of this company is high voltage rubber covered wires for any and all classes of work. They carry a complete stock in San Francisco.

One of the latest companies they have added to their list of agencies is the National Conduit and Cable Company, who manufacture the highest grade paper insulated, lead encased cables for telephone, telegraph and lighting and power circuits. This concern has added a weatherproof and bare copper department, and in connection with same have built one of the largest wire drawing mills in the United States, and from the fact that they are now drawing all their own copper, they are in a position to furnish the lowest prices offered on all classes of bare copper wire, weatherproof wire and paper insulated lighting cables. They have arranged to carry with the John R. Cole Company, as their Pacific Coast agents, a complete stock of double and triple braid weatherproof wire, from No. 14 to 1,000,000 circular mils. Their weatherproof insulation is recognized to be the very highest grade on the market, and it is a boast of the company that they propose to be leaders in high insulation in this class of material. They have a large stock now

THE NEW QUARTERS OF THE JOHN R. COLE COMPANY

en route via the Horn, which will be in this city in about six weeks time, when they will be open for orders for delivery from San Francisco stock at the very lowest market prices.

They are also agents of the H. T. Paiste Company, of Philadelphia, who manufacture a complete line of sockets, receptacles and the well known Fielding receptacle. Orders taken for these goods are for factory delivery.

They also represent the Chase-Shawmut Company, of Newburyport, Mass., on their complete line of enclosed fuses and fuse blocks, fuse wire and wire links, theater switchboards, rail bonds, etc. This company's enclosed fuses and fuse blocks are conceded to be the very neatest, and the principle they have of showing when the fuse is blown has created a very large demand for them.

The above company has recently closed the agency for C. J. Bogue, of New York, for the State of California, on his complete line of marine projectors and searchlights, photo-engraving and theatrical lamps and also electric plating dynamos.

They wish to announce that with their increased facilities all orders received will be given immediate attention for goods which they carry in San Francisco.

INDUSTRIAL

SOME TURBO-ELECTRIC APPARATUS FOR MANILA.

AN important export order has just been closed with the Manila Construction Company, an American corporation conducting operations in the city of Manila, P. I., for a complete power equipment for the city traction system. The order was secured through Westinghouse, Church, Kerr & Co., and comprises three 7500-kilowatt Westinghouse turbo-generator units, two compound engine exciter units, one motor-driven exciter unit, three 500-kilowatt rotary converters, one 300-kilowatt rotary converter, four 250-kilowatt oil-insulated transformers, complete switchboard and one series booster, which is mounted on the extended shaft of one of the rotary converters. The car equipments will comprise nine double No. 68 C outfits and ten double No. 56 outfits, using standard Westinghouse controllers.

The first turbo-generator unit will be delivered in about nine months. The turbine will operate at 150 pounds steam, twenty-five to twenty-seven inches vacuum and 150 degrees superheat. It is fitted with the usual by-pass for securing an overload capacity of 50 per cent. It is also equipped with a quick-closing throttle-valve.

The turbo-generators will furnish three-phase, sixty-cycle current at 380 volts. Part of the current will be converted to direct-current by the power-house railway substation, and the remainder will go to transformers for supplying high-tension distributing system. The transformers are oil-cooled and connected in the two-phase, three-phase or Scott system for three-phase transmismission. The turbine machinery will also furnish current to the local light and power system.

STORAGE BATTERY BUSINESS.

RECENTLY the Electric Storage Battery Company, of Philadelphia, closed a contract with the Indiana Interurban Construction Company for the installation of a battery of "Chloride Accumulators" for the Kokomo, Marion and Western Traction Company, at Kokomo, Ind. This battery consists of 288 cells, having a capacity of 384 kilowatts, to be used in regulating the load on sixty-cycle rotaries, so that the lighting and railway service can be obtained from the same generators.

A contract has also been closed with the Department of Commerce and Labor, at Washington, D. C., for two batteries to be operated by the National Bureau of Standards and Weights, at Washington; with the Clark University, at Worcester, Mass., and with the Bacon Air Lift Company for the residence of Hermon B. Duryea, Westbury, L. I. This latter installation consists of a battery of sixty-eight cells, having a capacity of forty-six kilowatts, to be used for lighting and power after the generator plant is shut down for the night.

CALIFORNIA GAS AND ELECTRIC CORPORATION.

THERE have been no serious interruptions reported in the service along the 600 miles of transmission lines of this corporation. There were a few minor disturbances as a result of the recent phenomenal floods and storms in the country north of here. The service to Oakland has had very little trouble. It is reported from Nevada County that about February 21st, 1904, a large bowlder became dislodged and rolled into the Rock Creek ditch above the power house. A passage was cleared around the rock and the operation of the plant was not disturbed. Superintendent F. G. Baum is still up the country supervising the work of keeping the lines and waterways in good condition. With the de Sabla plant at Nimshew to depend upon and the steam plants of the Standard Electric at San Jose and the North Shore Railroad at Alto to use in emergencies, the company is unlikely to suffer from shutdowns in future. A reserve steam plant in the vicinity of Santa Rosa is in contemplation. Two additional 4000-kilowatt generators are to be installed at de Sabla this year, but the equipment of the French Creek plant will not be rushed.

NEW CONTRACTS SECURED.

THE Northern Electrical Manufacturing Company, of Madison, Wisconsin, has recently secured an order from the Consolidated Water, Power and Light Company, of Grand Rapids, Wisconsin, for direct current machinery including two 300-kilowatt generators and forty motors ranging in capacity from five horsepower to 140 horsepower. This apparatus will be used in a paper mill. The company has completed an order for the Kalamazoo Paper Company, of Kalamazoo, Michigan, for two 150-kilowatt generators, one forty-kilowatt generator and eleven motors ranging from 7.5 horsepower to forty horsepower, aggregating 172.5 horsepower. Northern apparatus is being installed in the plant of the Malta Vita Pure Food Company, of Battle Creek, Michigan, including one 150-kilowatt generator and one forty-kilowatt generator, an aggregate of 232 horsepower in motors ranging from two to ten horsepower, a total of thirty-two motors.

REMOVAL NOTICE.

WE beg to announce that after March 1, 1904, the offices and showrooms of Hunt, Mirk & Co. will be located at 614 Mission Street, first floor of the Crossley Building. This company, the readers of THE JOURNAL will remember, are the Pacific Coast agents for the Westinghouse Machine Company. They have lately added several new lines of steam specialties to the large number already carried by them, among which may be mentioned the Worthington condensing apparatus, Laidlaw-Dunn-Gordon pumping machinery, together with a full line of steam utilities. It may be said that this firm will be located in a building where they will have the association of many of the large electrical companies. This firm has made steady advance in the steam engineering line, and in the future we may look to them for the advancement of the steam turbine in the additions that are contemplated in our steam power plants.

Contradicting the suggestion of a slackening of business activities comes the report from the Imperial Pneumatic Tool Department of the Rand Drill Company telling of the large increase of sales since the first of the year. That the sterling worth of their products is universally appreciated is proven by the orders received for piston air drills, Wood boring machines and hammers and the installation of a number of complete pneumatic tool plants in the railroad shops, ship yards, boiler works, foundries and bridge and iron works both in this and foreign countries.

The Nernst Lamp Company, in accordance with its new policy of establishing district offices in the large cities, has recently opened an office at 47 State Street, Detroit Mich., and appointed Charles F. Case as district sales manager of the same. The territory embraced by this office is the lower peninsula of the State of Michigan, the northwestern part of Ohio and the northeastern part of Indiana.

John W. Brooks, sales manager for Pass & Seymour (incorporated), of Solvay, N. Y., is on the coast looking out for matters pertaining to the interests of the firm he represents. Mr. Brooks was one of the founders of the Brooks-Follis Electric Corporation, and found a host of friends to greet him on his visit.

A member of the firm of Stone Bros., railroad contractors, has been in Petaluma recently for the purpose of figuring on the contract of building the entire electric railroad of the Petaluma and Santa Rosa Electric Company between Petaluma and Sebastopol.